Response of RFP Proposal Team

to the

Consensus Technical Summary of the Review Panel for the RFP Proof-of-Principle Proposal

(July, 1998)

The RFP proposal team agrees with all the essential conclusions of the review panel. The panel report accurately and astutely describes the advantages, challenges, and status of RFP research. We agree with the priority ranking which the panel assigns to the research areas of confinement, current drive, resistive wall instabilities, and beta limits.

The panel offers two recommendations. First, although the panel stated that the proposed plan is "logical and well thought out and the budget requested is appropriate to the tasks.....and relatively modest," it nonetheless suggests that the tasks be more strongly sequenced. The MST program is designed to investigate confinement, current drive, and beta limits. It is appropriate, as the panel suggests, to prioritize the experimental effort "in accordance with the programmatic importance of the issues." The MST program presented to the panel investigates the three issues roughly in parallel. However, the individual tasks are staged so that essential feasibility tests occur prior to the commitment of large funds to new endeavors (such as high power neutral beam and lower hybrid wave injection). In response to the panel suggestion for a more serial study of the three issues we have two comments.

1. We propose to delay the initiation of neutral beam heating by one year (to the fifth year of the proposed work), in recognition of the lower priority of beta limit studies. The delay will also permit a more thorough investigation of the feasibility of beam heating through study of the orbits of fast ions generated by a diagnostic neutral beam and theoretical modeling. However, an important point, which we did not emphasize in the proposal presentation, is that neutral beam heating serves several critical functions beyond beta limit studies. For example, it will permit the electron temperature to be varied (most of the beam energy is transfered to electrons), a key tool in understanding transport. This will permit investigation of Lundquist number scaling, an important RFP physics issue. Increasing the electron temperature may also enhance the efficiency of the various current profile control

methods, such as inductive means and lower hybrid wave techniques (assuming that wave losses to fast ions are small). Heating may also influence the plasma flow, and its effect on transport, as occurs in tokamaks. Thus, neutral beam heating enters as an important part of the confinement research program. In sum, we believe that a one year delay in beam heating, from that originally proposed, is a judicial balance between the lower priority of beta limit studies and the important beam uses for confinement studies.

2. MST will test oscillating field current drive as a technique for sustainment of the bulk plasma current. This task will consume less than 10% of the proposed MST resources, and employs conventional ignitron switch and capacitor bank technology which is well within the experience base of the MST group. Indeed, the system design is nearly complete. Hence, although it may be a less urgent task, there would be little gained by delaying its test.

The second recommendation of the panel is that the experimental plan for the resistive wall problem be "developed in the context of the entire fusion program." We agree with this judgment, but stress that the occurence of multiple modes in the RFP is a feature not common to most other configurations, and it is important to move forward rapidly with experimental study of this important issue for the RFP. The resistive wall issue is best studied in concept exploration experiments, not in MST. We wish to stress that an effective RFP research program will also require strong effort in theory and computation.